display section and is thus detected very accurately with a simple construction comprising the mark sensor, the first camera, and the display section.

REMARKS

Favorable consideration of this application, as presently amended, is respectfully requested.

The claims have been amended by the present response to no longer recite any reference numerals and to correct for certain improper multiple dependencies.

The Abstract has been amended by the present response to no longer recite any reference numerals and to make minor clarifications.

The present application is believed to be in condition for a full and thorough examination on the merits. An early and favorable consideration of the present application is hereby respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Surinder Sachar

Gregory J. Maier
Registration No. 25,599
Attorney of Record
Surinder Sachar
Registration No. 34,423

22850

(703) 413-3000
Fax #: (703)413-2220
GJM:SNS/smi
I:\atty\SNS\217704US-pr.wpd

Marked-Up Copy
Serial No: _____
Amendment Filed on:
12-26-2001

IN THE CLAIMS

Please amend the claims as follows:

--1. (Amended) A rotational phase difference detecting system [(15)] for detecting a rotational phase difference between a plurality of rotating bodies, comprising:

a first rotating body [(13)] with a first mark [(12)];

a second rotating body [(11)] with a second mark [(10)];

a mark sensor [(4)] for detecting said first mark;

a first camera [(2)] for imaging said second mark when said mark sensor detects said first mark; and

a display section [(7)] for displaying said second mark imaged by said first camera;

wherein a rotational phase difference between said first and second rotating bodies is detected from a position of an image of said second mark displayed on said display section.

2. (Amended) The rotational phase difference detecting system as set forth in claim 1, further comprising an optical system [(1)] for restricting an imaging range of said first camera [(2)];

wherein said first camera images said second mark [(10)] through said optical system.

3. (Amended) The rotational phase difference detecting system as set forth in claim 2, further comprising a light-emitting device [(3)] for emitting light to said second rotating body [(11)] through said optical system [(1)];

wherein light from said light-emitting device is irradiated to said second rotating body [(11)] when said mark sensor [(4)] detects said first mark [(12)].

4. (Amended) The rotational phase difference detecting system as set forth in claim 2, further comprising an actuator [(30)] for driving said first camera [(2)] and said optical system [(1)] so that an optical axis of said optical system is approximately normal to a side surface of said second rotating body [(11)].

5. (Amended) The rotational phase difference detecting system as set forth in claim 1, further comprising an arm [(23)] which has said first camera [(2)] and said mark sensor [(4)] mounted on one end thereof and a predetermined weight [(24)] mounted on the other end;

wherein said arm is mounted on a vibration removing table [(21)] mounted on columns through an elastic body [(25)].

6. (Amended) The rotational phase difference detecting system as set forth in claim 1, further comprising a second camera [(42)] for imaging a third mark [(40)] provided on said first rotating body [(13)] when said mark sensor [(4)] detects said first mark [(12)];

wherein said display section [(7)] displays an image of said third mark imaged by said second camera.

7. (Amended) A rotational phase difference detecting method of detecting a rotational phase difference between a plurality of rotating bodies, comprising the steps of:

detecting a first mark [(12)] provided on a first rotating body [(13)];

imaging and displaying a second mark [(10)] provided on a second rotating body [(11)], when said first mark is detected; and

detecting a rotational phase difference between said first and second rotating bodies from a position of an image of said second mark.

8. (Amended) The rotational phase difference detecting method as set forth in claim 7, further comprising the steps of:

imaging and displaying a third mark [(40)] provided on said first rotating body [(13)], when said first mark [(12)] is detected; and

detecting a position of an image of said second mark with an image of said third mark as reference.

9. (Amended) A machine operating-state monitoring system, comprising the rotational phase difference detecting system [(15)] as set forth in claim 1 [any one of claims 1 through 6], for monitoring an operating state of a machine by employing said rotational phase difference detecting system.

10. (Amended) The machine operating-state monitoring system as set forth in claim 9, wherein

said rotational phase difference detecting system comprises a rotational phase difference calculating section [(16)] for calculating a rotational phase difference between the first and second rotating bodies [(13, 11)], and a rotational phase difference deciding section [(17)] for deciding whether or not the rotational phase difference computed by said rotational phase difference calculating section is a predetermined value or greater; and

alarm means [(19)] is provided for output an alarm in response to a signal from said rotational phase difference deciding section.

11. (Amended) The machine operating-state monitoring system as set forth in claim 9, wherein

said rotational phase difference detecting system comprises a rotational phase difference calculating section [(16)] for calculating a rotational phase difference between the first and second rotating bodies [(13, 11)]; and

said display section [(7, 18)] displays the calculated rotational phase difference in a time-series manner.

12. (Amended) A machine operating-state monitoring system for monitoring an operating state of a machine provided within a factory by a factory-side system [(105)] and a remote-side system [(107)] connected through a transfer medium [(106)], wherein

said factory-side system comprises the rotational phase difference detecting system [(15)] as set forth in [any one of claims 1 through 6] claim 1, and alarm means [(19)] for outputting an alarm;

said remote-side system comprises a rotational phase difference deciding section [(109)] for deciding whether or not a rotational phase difference detected by the rotational phase difference detecting system is a predetermined value or greater; and

when it is decided by said rotational phase difference deciding section that said rotational phase difference is said predetermined value or greater, said remote-side system transmits a signal to said factory-side system through said transfer medium, and said alarm means [(19)] outputs an alarm in response to said signal.

13. (Amended) A machine operating-state monitoring system for monitoring an operating state of a machine provided within a factory by a factory-side system [(105)] and a remote-side system [(107)] connected through a transfer medium [(106)], wherein

said factory-side system comprises

a first rotating body [(13)] with a first mark [(12)],

a second rotating body [(11)] with a second mark [(10)],

a mark sensor [(4)] for detecting said first mark, and

a first camera [(2)] for imaging said second mark when said mark sensor detects said first mark;

said factory-side system further comprises alarm means [(19)] for outputting an alarm;

said remote-side system comprises

a rotational phase difference calculating section [(16)] for calculating a rotational phase difference between the first and second rotating bodies, based on information on said second mark imaged by said first camera, and

a rotational phase difference deciding section [(109)] for deciding whether or not the rotational phase difference calculated by said rotational phase difference calculating section is a predetermined value or greater; and

when it is decided by said rotational phase difference deciding section that said rotational phase difference is said predetermined value or greater, said remote-side system transmits a signal to said factory-side system through said transfer medium, and in response to said signal, said alarm means [(19)] outputs an alarm.

14. (Amended) A machine operating-state monitoring system for monitoring an operating state of a machine provided within a factory by a factory-side system [(105)] and a remote-side system [(107)] connected through a transfer medium [(106)], wherein

said factory-side system comprises

a first rotating body [(13)] with a first mark [(12)],

a second rotating body [(11)] with a second mark [(10)],

a mark sensor [(4)] for detecting said first mark, and

a first camera [(2)] for imaging said second mark when said mark sensor detects said first mark;

said factory-side system further comprises a display section [(18)];

said remote-side system comprises a rotational phase difference calculating section [(16)] for calculating a rotational phase difference between the first and second rotating bodies, based on information on said second mark imaged by said first camera; and

the rotational phase difference between the first and second rotating bodies, calculated by said rotational phase difference calculating section, is transmitted from said remote-side system to said factory-side system through said transfer medium and is displayed on said display section in a time-series manner.

15. (Amended) The machine operating-state monitoring system as set forth in any one of claims 9 through 14, wherein

a print with a possibility of printing trouble is extracted by monitoring an operating state of a printing machine; and

said plurality of rotating bodies are printing rolls [(13, 11)].

16. (Amended) A machine operating-state monitoring method of monitoring an operating state of a machine by a rotational phase difference between a plurality of rotating bodies, comprising:

an imaging step of imaging a second mark [(10)] provided on a second rotating body [(11)] by a first camera [(2)] when a mark sensor [(4)] detects a first mark [(12)] provided on a first rotating body [(13)]; and

a rotational phase difference calculating step of calculating a rotational phase difference between said first and second rotating bodies, based on information on said second mark imaged by said imaging step.

17. (Amended) The machine operating-state monitoring method as set forth in claim 16, further comprising:

a rotational phase difference deciding step of deciding whether or not said rotational phase difference calculated by said rotational phase difference calculating step is a predetermined value or greater; and

an alarm output step of outputting an alarm when it is decided in said rotational phase difference deciding step that said rotational phase difference is said predetermined value or greater.

18. (Amended) The machine operating-state monitoring method as set forth in claim 16, further comprising a display step of displaying said rotational phase difference calculated by said rotational phase difference calculating step on a display section [(18)] in a time-series manner.

19. (Amended) A machine operating-state monitoring method of monitoring an operating state of a machine provided within a factory by a factory-side system [(105)] and a remote-side system [(107)] connected through a transfer medium [(106)], said monitoring method comprising the steps of:

detecting a rotational phase difference by the rotational phase difference detecting system as set forth in [any one of claims 1 through 6] claim 1, provided in said factory-side system;

transmitting information on the detected rotational phase difference from said factory-side system to said remote-side system through said transfer medium;

deciding whether or not said rotational phase difference is a predetermined value or greater, based on the rotational phase difference information received by a rotational phase difference deciding section [(109)] provided in said remote-side system;

transmitting a signal from said remote-side system to said factory-side system through said transfer medium when said phase difference deciding section decides that said rotational phase difference is said predetermined value or greater; and

outputting an alarm by alarm means [(19)] provided in said factory-side system when said signal is received.

20. (Amended) A machine operating-state monitoring method of monitoring an operating state of a machine provided within a factory by a factory-side system [(105)] and a remote-side system [(107)] connected through a transfer medium [(106)], said monitoring method comprising the steps of: Fig. 7

imaging a second mark [(10)] provided on a second rotating body [(11)] by a first camera [(2)] provided in said factory-side system when a mark sensor [(4)] provided in said factory-side system detects a first mark [(12)] provided on a first rotating body [(13)];

transmitting information on the imaged second mark from said factory-side system to said remote-side system through said transfer medium;

calculating a rotational phase difference between said first and second rotating bodies, based on said second-mark information received by a rotational phase difference calculating section [(16)] provided in said remote-side system;

deciding whether or not the calculated rotational phase difference is a predetermined value or greater, by a rotational phase difference deciding section [(109)] provided in said remote-side system;

transmitting a signal from said remote-side system to said factory-side system through said transfer medium when said phase difference deciding section decides that said rotational phase difference is said predetermined value or greater; and

outputting an alarm by alarm means [(19)] provided in said factory-side system when said signal is received.

21. (Amended) A machine operating-state monitoring method of monitoring an operating state of a machine provided within a factory by a factory-side system [(105)] and a remote-side system [(107)] connected through a transfer medium [(106)], said monitoring method comprising the steps of:

imaging a second mark [(10)] provided on a second rotating body [(11)] by a first camera [(2)] provided in said factory-side system when a mark sensor [(4)] provided in said factory-side system detects a first mark [(12)] provided on a first rotating body [(13)];

transmitting information on the imaged second mark from said factory-side system to said remote-side system through said transfer medium;

calculating a rotational phase difference between said first and second rotating bodies, based on said second-mark information received by a rotational phase difference calculating section [(16)] provided in said remote-side system;

transmitting information on the calculated rotational phase difference from said remote-side system to said factory-side system through said transfer medium; and

displaying the transmitted information on a display section [(18)] provided in said factory-side system in a time-series manner.

22. (Amended) The machine operating-state monitoring method as set forth in any one of claims 16 through 21, wherein

a print with a possibility of printing trouble is extracted by monitoring an operating state of a printing machine; and

said plurality of rotating bodies are printing rolls [(13, 11)].--

IN THE ABSTRACT

Please amend the Abstract on page 63 as follows:

--ABSTRACT

[Disclosed herein is a] A rotational phase difference detecting system, a [and] method that is capable of very accurately detecting a rotational phase difference between a plurality of rotating bodies, a[. There is also disclosed a] machine operating-state monitoring system, and a method employing the rotational phase difference detecting system. The detecting system has a first rotating body [(13)] with a first mark [(12)], a second rotating body [(11)] with a second mark [(10)], a mark sensor [(4)] for detecting the first mark, a first camera [(2)] for imaging the second mark when the mark sensor detects the first mark, and a display section [(7)] for displaying the second mark imaged by the first camera. The rotational phase difference is detected from a position of an image of the second mark displayed on the display section and is thus detected very accurately with a simple construction comprising the mark sensor, the first camera, and the display section.--